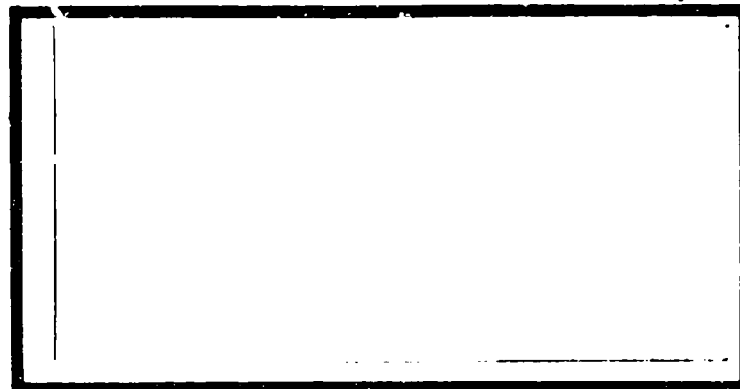


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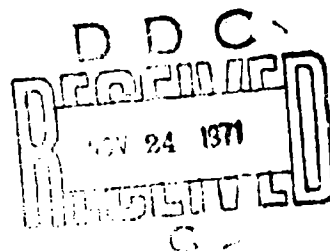
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A CRITICAL REVIEW AND COMPARATIVE
ANALYSIS OF DEFINITIONS, CONCEPTS,
AND STATE OF THE ART IN LITERATURE
REGARDING SYSTEMS MANAGEMENT

THESIS

Roger L. Williams, B.S.
Captain USAF

GSM/SM/71-14



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A CRITICAL REVIEW AND COMPARATIVE
ANALYSIS OF DEFINITIONS, CONCEPTS,
AND STATE OF THE ART IN LITERATURE
REGARDING SYSTEMS MANAGEMENT

THESIS

Presented to the Faculty of the School of Engineering
of the Air Force Institute of Technology

Air University

in Partial Fulfillment of the
Requirements for the Degree of
Master of Science

by

Roger L. Williams, B.S.
Captain USAF

Graduate Systems Management

September 1971

Approved for public release; distribution unlimited.

Preface

This paper represents the results of a study concerning the systems management concept. The paper considers several aspects of the systems management concept and is intended to identify, define, and differentiate the terms and concepts associated with the systems management concept. The study examines the current status of systems management as a school of thought in the management field.

During studies at the AFIT School of Systems Management, the writer became aware of the need for a comprehensive review of the literature on the topic of systems management. The main problem usually centered on semantics and the failure of most authors to differentiate and define the terminology they used. While most of the subject matter found on the subject of the systems management concept dealt with its use in weapon systems development, the question arose as to whether this was really what the systems management concept was all about.

The direction of this report is not to ignore the implementation of the systems management concept in the weapon development field, but to present the total picture of systems management from some of its other pertinent aspects.

The writer wishes to acknowledge the assistance of Mr. John Enell and Ron Hermone of the American Management Association and Mr. Stanley Gill of the National Management Association in providing a clearer insight into the systems management concept. The writer is also indebted to their

respective organizations for material they generously provided the writer.

The writer is also grateful to the NASA Scientific and Technical Information Facility and the Defense Documentation Center for the background material they provided.

A very special thanks to Professor Raymond Klug for his unselfish gift of time, encouragement, and guidance in this research effort. It has been through his efforts that a better understanding and appreciation for the principles of management have been obtained by the writer.

Finally, the writer wishes to express a warm appreciation for Mrs. Mary E. Batman for her typing of this report.

Roger L. Williams

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Abstract

In the last two decades the concept of systems management has been broadly applied and frequently treated in management literature. The rapid growth and expansion of the systems management concept has resulted in conflict and contradiction concerning its terminology, status, application, and philosophy. In view of this apparent conflict and contradiction, this research study was undertaken to develop and present a comprehensive review and comparative analysis of the literature concerning the systems management concept. This study is directed toward that objective and was pursued and achieved under the Air Force Institute of Technology graduate program in Systems Management through the following methodology.

The principle methodology applied was a review and critical comparison of secondary source data obtained mainly from libraries and correspondence with professional journals and associations. Through the use of the data obtained, the definitions of a system and the systems approach were studied and compared as they appeared in the literature. Next the relationship of the systems approach and management was examined. The systems management concept was then viewed through its ancestry, present applications, and its future importance. Finally, the literature was analyzed to establish the current status of systems management as a separate school of management thought.

The systems approach to management is based on a belief in orderly relationships and the interdependency and interaction of component parts and received its current impetus as the result of twentieth-century trends in technological complexities. The systems management concept is a way of thinking and provides a model for better identification and understanding of relationships and interdependencies in a changing organization responding to a dynamic environment. The future importance of the systems management concept is that it offers a potentially sound approach to both the recognition and solution to the many complex social-economic problems facing mankind. Little support is found in the literature to establish the systems management concept as a separate school of management thought.

Further research is recommended by the writer in relating the functions of management to the systems concept as well as an investigation of how the concept is being or can be extended and applied in the social-economic areas.

A CRITICAL REVIEW AND COMPARATIVE
ANALYSIS OF DEFINITIONS, CONCEPTS,
AND STATE OF THE ART IN LITERATURE
REGARDING SYSTEMS MANAGEMENT

I. Introduction

The concept of "systems management" or a "systems approach" to management has received a great deal of attention in academic writings and management circles. References to systems are sprinkled throughout current writings of management theorists and the language of today's managers. Is the systems concept a new and useful concept, or is it simply a matter of changing semantics? One of the earliest recorded statements concerning systems management can be traced to 500 B.C. when Mencius declared:

"Whoever pursues a business in this world must have a system. A business which has attained success without a system does not exist. From ministers and generals down to the hundreds of craftsmen, everyone of them, both skilled and unskilled, use this system. The skilled may at times accomplish a circle and a square by their own dexterity. But with a system, even the unskilled may achieve the same result, though dexterity they have none. Hence, every craftsman possesses a system as a model. Now, if we govern the empire, or a large state, without a system as a model, are we not even less intelligent than a common craftsman?" (Ref 51:26).

In other words Mencius was saying that all managers, to be effective, must recognize and utilize a system. Unfortunately, the word "system" has many meanings and covers an

extremely broad spectrum of concepts. Thus the term "systems management" does indeed lead one to confusion and mental entanglement.

A manager must get things done by working with people and physical resources in order to accomplish the objectives of the organization. The systems concept does not eliminate the need for the basic functions of planning, organizing, directing, and controlling. However, there is a definite change of emphasis, for the functions are performed in conjunction with operations of the system and not as separate entities. The systems approach stresses the interrelatedness of activities within an organization as opposed to isolated departments found in the traditional bureaucratic organization.

The systems management concept has proven to be of great value in the management of complex programs and projects. This is particularly true in the development of complex weapons systems. Systems management, both past and present, is the product of applying the systems concept to the management of a complex environment. The application of the systems management concept appears in the literature under a variety of names. Some of the more familiar are systems management, weapon system management, project management, and program management. Differences and similarities among these terms are discussed in Chapter III. The term systems management is used in this report as the concept of applying the systems approach to management.

This report covers the systems concept and its applications from the view of the literature available on this subject. Through a comprehensive review of the literature, a comparison and critical analysis will hopefully develop into a more structured set of concepts and terminology concerning systems management. Also, by tracing the evolution of systems management concepts, it is intended that a clearer understanding of the applications as well as future role as a school of management thought will become evident. It is with a great deal of certainty that the attainment of professional status by management rests heavily upon the establishment of sound definitions and concepts. It is with this premise that this report is presented.

Problem

The rapid growth and expansion of the Systems Management concept has resulted in conflict and contradiction concerning its terminology, status, application, and philosophy. As a result of this conflict and contradiction the need exists for a comprehensive and comparative review of the literature concerning the systems management concept.

Objectives

The research effort related to this thesis has four main objectives:

1. Identify and differentiate the terms, definitions, and concepts as they appear in the literature associated with systems management.

2. Establish whether systems management is really a new approach in the management field.

3. Produce a completed research product that will aid in the development of a current assessment of the past, present, and future of the systems management concept.

4. Serve as a valuable learning experience for the writer through the application of academic discipline to produce a completed research paper.

Scope and Limitations

Time limits the research effort to one of an initial approach to identify, review, and critically analyze the concepts and terminology in the literature in the systems management field. The library research was limited to appropriate, accessible libraries within travel limitations. The review of the literary material covered much of the pertinent management sources currently available. The greatest asset from this literature review will be the presentation of many varying views concerning systems management.

Two hundred and five sources are listed in the bibliography. This volume was needed in order to present a reasonably comprehensive review and coverage of the many salient differences and similarities that are found in the literature on systems management. As a planned phase for reassurance, a representative sample of fifty major management texts that did not by their titles indicate that they contained information concerning the systems management concept, was reviewed. These fifty books were written during the same period and essentially on the same subject material as the one hundred

and fifty-five sources listed in the research study and are presented in the supplemental bibliography. The purpose of this procedure was to give confidence to the writer that no major omission concerning systems management in the literature occurred. Of the one hundred and fifty-five sources involved in the research, sixty-five per cent are from periodicals. The fact that the majority of writings were found in periodicals gives evidence to the relatively current emphasis of the systems management concept.

A milestone of progress chart was developed as a planning and control device to help insure that the research was completed on schedule.

The completed research paper was produced through the application of the academic and research disciplines acquired at the Air Force Institute of Technology in the Graduate Systems Management graduate program. The steps that were followed included: identification of the topic, development of a logical approach, framing the objectives and methodology, search and gathering of data, visiting appropriate, accessible libraries, contacting professional management associations and reviewing their journals and literary source materials for data, analyzing the data, presenting the data, writing the thesis, and preparing for and presenting an oral defense of the research effort.

Research Methodology

The principle methodology used was the review and critical comparison of secondary source data obtained

mainly from library sources and correspondence with professional journals and associations.

Library Research: A search of the existing literature was conducted through the Defense Documentation Center, Alexandria, Virginia and the NASA Scientific and Technical Information Facility at College Park, Maryland. Material from the following libraries were researched to obtain the necessary secondary source data:

1. Air Force Institute of Technology
Wright-Patterson AFB, Ohio
2. Wright State University
Dayton, Ohio
3. University of Dayton
Dayton, Ohio
4. Ball State University
Muncie, Indiana
5. Indiana University
(Main and Business)
Bloomington, Indiana
6. New York City Public Library
(Mid Manhattan Branch)
New York, New York
7. American Management Association
New York, New York
8. Society for the Advancement of Management
New York, New York
9. National Management Association
Dayton, Ohio
10. Ohio State University
(Main and Commerce)
Columbus, Ohio
11. New York University
(Main and Commerce)
12. St. Louis University
St. Louis, Missouri

13. University of Missouri
Columbia, Missouri
14. Air Force Logistics Library
Wright-Patterson AFB, Ohio
15. Professor Raymond Klug
Personal Library
Wright-Patterson AFB, Ohio

Correspondence. Editors of several management journals were contacted by letter (See Appendix A) and their assistance proved to be of great value in the research effort. Pertinent issues of the following periodicals were researched:

1. California Management Review
2. Business Horizons
3. Advanced Management Journal
4. Air University Review
5. Wall Street Journal
6. Personnel Management
7. Fortune
8. Management Science
9. Harvard Business Review
10. Aerospace Management
11. Government Executive
12. Management Review
13. Academy of Management Journal
14. Personnel
15. Michigan Business Review
16. Industrial Management Review

The information obtained from these journals and the cooperation each exhibited proved to be a very fruitful addition to the research effort.

Organization of the Report

This chapter introduces and presents background information concerning the thesis topic. The material presented in Chapters II and III establish the systems concept, present various selected definitions of the terms associated with the systems concept, and trace the evolution of its application. Chapter IV presents the various views concerning the terms and concepts of systems management as they are used by the various authors in the literature. The terms and concepts are compared and analyzed as to salient differences and similarities. Chapter V traces the evolution of the systems management concept from past to present and projects the role that systems management may play in the future. Chapter V also deals with the question of whether systems management is truly a school of management thought. Chapter VI presents the summary and conclusions that were derived from the research effort. Recommendations for future research are also found in Chapter VI.

II. The Systems Concept

It is indeed ironic that the concepts and terms used to discuss systems have not themselves been organized into a system (Ref 1:661). The importance of the systems concept as it relates to this report lies in its position as the root of the more modern, scientific approaches to management.

In order to examine the systems concept it is necessary to first examine the general systems theory and look carefully as to just what is meant by the term system and systems approach. While the number of different definitions of system and systems approach appears to equal the number of authors on the subject of the systems concept, it is hoped that through analysis and synthesis of the definitions enough similarity can be found to provide a workable basis and understanding of these terms as they apply to the systems management concept.

This chapter treats the systems concept separately from its application and implementation in management. It is presented in order to provide a background of understanding concerning the systems concept before the introduction of its application in the field of management. This relationship of the systems concept and management applications and implementations are developed and presented in the next chapter.

General Systems Theory

According to Johnson, Kast, and Rosenzweig, the general systems theory is concerned with developing a systematic,

theoretical framework that describes the general relationships of the empirical world (Ref 77:369). The general systems theory attempts to establish a theoretical model of framework which ties all disciplines together into a meaningful relationship. Kenneth E. Boulding defines the theory as follows:

General systems theory describes a level of theoretical model-building which lies between the highly generalized constructions of pure mathematics and the specific theories of the specialized disciplines (Ref 16:197).

A number of authorities who specialized in diverse fields have contributed to the development of systems theory. Two of the better known are Ludwig von Bertalanffy and Kenneth E. Boulding. Both men are recognized as having provided basic concepts for the general systems theory.

Ludwig von Bertalanffy, a biologist, is considered by some sources as an acknowledged early contributor to the general systems theory on the basis of an article he wrote in 1951 (Ref 110:53). His work in the development of a general theory of systems produced a unifying framework for the separate scientific disciplines that were at the time in a state of fragmentation. He provided an integrating approach to the study and development of a wide range of scientific disciplines.

Boulding continued the work of von Bertalanffy by defining in 1956 nine levels of systems, arranging the theoretical systems and constructs in a hierarchy of

complexity (Ref 110:53). The nine levels of complexity that Boulding listed are:

1. Frameworks - level of static structure
2. Clockworks - level of the simple dynamic system with predetermined, necessary controls
3. Thermostat - level of the control mechanism or cybernetic system
4. Open System - level of the self-maintaining structure, might be called the cell
5. Genetic-Societal - level of the plant
6. Animal - level characterized by increased mobility, teleological behavior, and self-awareness
7. Human - level of the individual human being considered as a system with self-awareness and the ability to utilize language and symbolism
8. Social System - level of human organization that considers the content and meaning of messages, the nature and dimensions of value systems, the transcription of images into historical record, the subtle symbolizations of art, music and poetry, and the complex gamut of human emotion
9. Transcendental - level of ultimates and absolutes and the inescapables and unknowables, and they also exhibit systemantic structure and relationship (Ref 77:369-370).

Kenneth E. Boulding points out that general systems theory is a point of view rather than a body of doctrine. The characteristics of the systems point of view are described by Boulding as follows:

1. The general systems proponent exhibits a prejudice in favor of system, order, regularity, and nonrandomness . . . and a prejudice against chaos and randomness.

2. The whole empirical world is more interesting when it is orderly. It is to the orderly segments of the world, therefore, that the general systems proponent is attracted.
3. If the general systems proponent embraces law to explain order he is ecstatic when he finds a law about laws.
4. He sets high value on quantification and mathematization, for these are great helps in establishing order.
5. Whereas the mathematician is content with the mere perception and demonstration of abstract order, the general systems man is interested in looking for empirical referents of these systems and laws of abstract order.
6. The process of finding empirical referents to formal laws can easily take either one of two possible directions. We may find some elegant relationship in the world of abstract mathematics and then look around the world of experience to see if we can find anything like it, or we may patiently piece out a rough empirical order in the world of experience and then look to the abstract world of mathematics to codify, simplify it, and relate it to other laws (Ref 71:63-64).

The writer perceives the concept of a general systems theory as an effort to combine the elements and processes that are common to all disciplines and to use this combination as the starting point in the development of a framework of interrelationships within the various disciplines. By using the general systems theory all disciplines can be related to one another.

Definition of System

With the general systems theory as background, keeping in mind that the important point is the concept of a general

systems theory, the various definitions of the word "system" presented by selected authors and sources are now examined. Because of the length and variety of definitions that follow, the name of the author(s) precedes the definition to give credit and so that the reader need not immediately refer back to the bibliography to ascertain the source of contributions.

1. Justin G. Longenecker - A system is a group or combination of component parts arranged in such a way as to constitute a unified whole (Ref 93:67).
2. Rocco Carzo and J. N. Yanouzas - A system is anything that consists of interdependent elements. The behavior or state of each element is dependent upon the behavior or state of the other elements (Ref 17:13).
3. Adrian M. McDonough and Leonard J. Garrett - A system is a means for accomplishing some purpose or set of purposes (Ref 98:2).
4. Henry L. Sisk - A system is composed of parts that are interrelated in a manner that forms a unified whole that is more than a mere summation of the parts (Ref 132:12).
5. Billy J. Hodge and Herbert J. Johnson - A system is a pattern of relationships within some relevant framework aimed at the attainment of some specific purpose (Ref 68:6).
6. Edwin S. Roscoe - A system is a formalized orderly pattern for arranging the components of an activity or structure (Ref 126:431).
7. Richard F. Neuschel - A system is a network of related procedures developed according to an integrated scheme for performing a major activity of the business (Ref 116:10).

8. Sidney Taylor - A system is an aggregation of interacting functions or components which have been assembled to achieve a specific objective or effort (Ref 138:30).
9. R. E. Gibson - A system is an integrated assembly of interacting elements designed to carry out cooperatively a predetermined function (Ref 52:216).
10. Charles J. Minnich - A system is a group of well-integrated procedures related to a basic function (Ref 109:1).
11. Dan Voich and Daniel A. Wren - A system is a purposeful, organized interrelationship of components in which the performance of the whole exceeds the individual outputs of all the parts (Ref 148:21).
12. David I. Cleland and William R. King - A system is an organized or complex whole: an assemblage or combination of things or parts forming a complex or unitary whole (Ref 27:10).
13. Johnson, Kast, and Rosenzweig - A system is an array of components designed to accomplish a particular objective according to plan (Ref 76:104).

Definition #13 by Johnson, Kast, and Rosenzweig was found to be accepted by many authors in the systems area and was adopted by them for use in their writings. According to Johnson, Kast, and Rosenzweig there are three significant points in their definition of a system:

- (1) there is a design or an established arrangement of materials, energy, and information
- (2) there is a purpose or objective which the system is designed to accomplish

(3) inputs of materials, energy, and information are allocated according to plan (Ref 76:113).

In analyzing the other definitions the idea of order, plan, or meaningful arrangement is significant. In order to describe any system it appears that spelling out the specific expected accomplishments and the specific mechanisms and procedures which are to be used in the process is necessary. The essential elements of a system are the concepts of purpose and interrelationships. The word "system" seems to connote plan, method, order, objective, and arrangement. For the purpose of this report a system is an array of related parts designed to function together in the achievement of a particular objective.

Before proceeding from the definitions of systems to a discussion on the systems approach it is appropriate to present Kenneth E. Bouldings colorful definition of a system by his use of poetry:

A system is a big black box
Of which we can't unlock the locks
And all we find out about
Is what goes in and what comes out.

Perceiving input-output pairs,
Related by parameters,
Permits us, sometimes, to relate
An input, output, and a state.

If this relation's good and stable
Then to predict we may be able,
But if this fails us - heaven forbid!
We'll be compelled to force the lid! (Ref 71:13).

The Systems Approach

The systems approach involves a belief in order and in relationships which are structured in terms of cause and effect. It is very simply the application of the systems concept to a problem or situation. It views a task as a unit or set of elements to be interrelated into an organic whole. Further discussion about the systems approach is presented in the next chapter as it relates to management.

An indication of the importance of the systems approach, however, is that it has received renewed impetus by the twentieth-century trends in technology. The linking of technology and science, and the development of the systems concept in response to this linkage is in fact a measure of our newly found technological capacity (Ref 35:71). Attention is now directed to the application of the systems concept - the systems approach - to the management of an ever changing environment. Chapter III examines the systems approach to management and further establishes the meaning of the systems management concept.

III. Systems Management - The Concept

The discussion so far has centered about systems and the systems concept. A common theme throughout the previous discussion was the concept of interrelationships. The systems concept is indeed useful because of its strong emphasis upon the interrelationships of components and function. Management is now introduced and related to the systems concept.

The systems concept and management are linked in that the role of management is seen as the management of interrelationships, the interrelationships of the functions of management and the factors of production. Any type of management, in fact, utilizes the systems concept in a least a rudimentary form. Management, on all levels, uses the systems concept as a means to tie interrelationships together.

The utilization of the systems concept as an approach to the understanding and practice of management has become more important as the complexities of the modern world have increased. It is important, therefore, to examine next the systems approach to management and to define what is meant by systems management. An analysis of how the functions of management are related and applied in systems management concludes the chapter.

Systems Approach to Management

Despite the seemingly endless volume of words written on the subject of the systems approach to management, no single, generally accepted definition has yet emerged (Ref 13:41). Much of the literature written, however, on the

subject of the systems concept deals with its application to the process of management. A few of the more prevalent definitions and explanations that deal with the systems approach to management are examined here to indicate the general thinking as evidenced in the research of the literature.

According to Seymour Tilles, the modern manager needs a new approach to his job for three main reasons (Ref 145:81):

1. He must have a way of thinking about management that permits him to take account of the tremendous amount of new knowledge that is appearing.
2. He has to have a framework that permits him to relate one specialty with another in his work.
3. He must be able to raise his sights above the hurly-burly of current in company operations and understand how his company relates to its complex environment - to the other great systems of which it is a part.

Tilles states that a systems approach to management promises to accomplish the above purposes. He points out that in this atomic age too many managers are talking of themselves and of their companies in buggy-whip terms from a point of view that has remained largely unchanged since it was formulated by Henri Fayol just after World War I.

G. M. Jenkins and P. V. Youle define the systems approach as:

The systems approach is the study of a firm in its totality so that men and material resources of the firm can be organized to realize the firms overall objectives (Ref 75:5).

Jenkins and Youle expand upon this definition by stating that:

The systems approach to management implies that every manager should be much more precise about decision-making and information flow. For this to be effective, a company should have an overall system of corporate objectives and then subsidiary systems must be set up to realize these objectives as efficiently as possible (Ref 75:5).

The industrial firm, as Jenkins and Youle point out, is indeed a system in that it exhibits the following five important properties of a system:

1. It is a grouping, possibly complex, of human beings and machines.
2. It can be broken down into sub-systems which interact with each other.
3. The system being studied will usually form part of a hierarchy of such systems.
4. To function at all, a system must have an objective, no matter how vaguely defined.
5. To function at maximum efficiency a system must be designed in such a way that it is capable of achieving its overall objective in the best way possible (Ref 75:6-7).

E. W. Martin offers the idea that the systems concept does not provide a set of rules for solving all problems, but is a useful device for viewing many phenomena for the following reasons:

1. It assumes that a system can be understood and that it should be designed to accomplish its purpose

2. It emphasizes the relationships between the parts and how these relationships affect the performance of the overall system (Ref 96:63).

The writer views the remarks of Martin as applying the application of knowledge concerning living organisms to complex electronic or mechanized systems to organizational or management systems.

Professor Glenn Gilman of Georgia Institute of Technology states:

The systems concept goes beyond the traditional definitions of organization. It views the enterprise as the central agency of an extended open system, encompassing a peripheral membership that interacts with, supports, and constrains the agency and its central membership (Ref 54:19).

Gilman is presenting the idea that the systems concept is a scheme that enables us to represent adequately the complexity of the interrelationships within a modern enterprise, and establish the understanding that must govern its performance. Gilman views the systems concept as a means of making effective use of our analytical tools in the management process.

Johnson, Kast and Rosenzweig of the University of Washington, early authors in the project management area, define the systems concept as it pertains to the management process as:

The systems concept is a useful way of thinking about the job of management. It provides a framework for visualizing

internal and external environmental factors as an integrated whole (Ref 76:3).

Johnson, et al perceive the systems concept as applied to management as an aid in resolving some of the complexity of management, while at the same time helping the manager recognize the nature of the complex problems and provide a method to operate in the complex environment (Ref 76:3). The same authors contribute the growth of the systems management approach to the increase in size, complexity, and diversity of operations of the modern organization. Indeed the systems concept has found its greatest application in large-scale, complex projects that are found in a dynamic, scientific and technological environment. Air Force procurement and industrial production of very complex major weapons systems is a clear example.

David I. Cleland and William R. King define the systems concept in management as:

The systems concept is the simple recognition that any organization is a system made up of segments, each of which has its own goals (Ref 27:11).

While the definition of the systems approach quoted previously by Jenkins and Youle mentioned the overall objectives of the organization, Cleland and King extend the idea one step further and include the objectives of each component in the organization.

Allan Harvey offers four main points that the systems approach accomplishes for management in its effort to deal

with the pressures of competition and the squeeze on profits:

1. The systems approach frees the corporation from the perils of its organizational straitjacket. Organizations serve the functions of business, but it inevitably violates some basic interrelationships that stand in the way of solving certain critical problems.
2. The systems approach makes it possible for management to make decisions with full knowledge of their impact on total costs.
3. The systems approach makes it possible to put to profitable use new techniques and new technology.
4. The systems approach puts a firm foundation under the corporate information and control procedures (Ref 64:68-69).

Harvey continues that it was this first point that led the military and its major weapons suppliers to move away from orthodox theory and practice, and adopt the systems management concept. His third point emphasizes the characteristics of rapidly advancing management techniques and the accelerating rate of technological change. His last point demonstrates the flow of materials and products in an organized, dynamic system so that management knows what information it needs to control the system.

The following various definitions of the systems approach to management are provided in order to better understand this broad and complicated subject.

1. The systems concept is a way of thinking about the job of management which provides a framework for visualizing internal and external factors affecting the organization as an integrated whole (Ref 81:328).

2. The systems approach is one which the things to be managed and the task of management are viewed as a unit - as a set of elements so interrelated that they form an organic whole (Ref 51:27).
3. The system concept views an organization as an integrated whole, where each system, subsystem, and supporting subsystem is associated with the total operation (Ref 76:403).
4. The systems concept provides a way of thinking about the management process. It presents a theoretical framework for viewing the internal and external environmental factors as integrated into the whole (Ref 25:4).

All of these definitions stress the fact that under the systems concept the organization is an integrated whole and that management views both the internal and external environment of the organization.

P. G. Thome and R. G. Willard state that the systems approach to management is justified in all types of applications where resources are limited and the systems are sufficiently complex that an intuitive or an inductive approach would lack the necessary thoroughness. According to these authors from the manager's point of view the systems concept should be approached with the following questions:

1. How many distinguishable elements are there to this seeming problem?
2. What cause-and-effect relationships exist among these elements?
3. What functions need to be performed in each case?
4. What trade-offs may be required among resources, once they are defined? (Ref 144:2).

In order to manage according to the systems concept a manager must see his organization as a system of interrelated and interdependently functioning parts. The value of the systems concept to management is the achievement of overall effectiveness of the organization while being objective-oriented. The systems approach to management automatically centers attention upon the objectives for which the organization has been established and helps to generate concerted and coordinated activity toward attainment of these objectives. The interdependence of elements is emphasized so that a manager is continually forced to view the organization as a component of the overall operating economy.

Systems Management Defined in the Literature

While the concept of a systems approach to management appears frequently in the literature, the definition of systems management proved to be a very elusive matter to specify in precise terms. Most authors were contented to describe what systems management does and how it relates to the functions of management. The following definitions did appear in the literature, but each appears to be inadequate as a single comprehensive definition of systems management.

1. Systems management is primarily a managerial and organizational concept adapting the five managerial functions - planning, organizing, staffing, direction, control - over a very broad spectrum of intracompany, intercompany, and inter-industry relationships (Ref 81:28).
2. Systems management is the combination of systems engineering - the integration of the physical components of an assembly -

and information systems - the establishment of a communication and information network between the various functions whose performance is necessary for a successful product mission (Ref 81:334).

3. Systems management is the process of planning, organizing, coordinating, controlling, and directing the combined efforts of Air Force contractors and participating organizations to accomplish system program objective (Ref 2:1).
4. Systems management is the direction, evaluation, and control of a specific system to assure timely and balanced meeting of a planned objective (Ref 74:36).

Through the process of comparing and contrasting the above definitions and the inclusion of other sources where only partial explanations or definitions were presented, the following definition is offered by the writer:

"Systems management is a process that emphasizes the interrelationships of the functions of management and adapts them to accomplish objectives."

It is interesting that these definitions so closely parallel many other definitions that are found in the literature concerning the basic term "management" without reference to systems.

The above discussion centered on the functions of management and it is noteworthy that no general agreement existed as to the exact number of these functions or as to their designation. While many groupings were found to exist in the literature dealing with the functions of management, the one that appeared most often contained plan, organize, direct, and control. These four functions,

therefore, will be used in this research effort with the following definitions, realizing that others have classified or grouped differently:

Plan - a basis for action to achieve objectives
Organize - establish a framework or structure of activities
Direct - energize, cause action
Control - constraint of action to help assure conformance to standard.

The Functions of Management

The systems management approach views the purpose of organization in substantially the same way as the traditional management school. The systems management approach views the organization as being composed of a number of subsystems or components. Johnson, Kast, and Rosenzweig define organization as:

The organization is an assemblage of people, materials, machines, and other resources integrated into a social system (Ref 76:55).

Clearly this definition follows very closely to concepts discussed perviously concerning the systems approach to management. Structuring a business or organization according to the systems management concept does not eliminate the need for performing the basic functions of planning, organization, control, and direction. There is, however, a definite change of emphasis, for the functions are performed in conjunction with total operations within the organization and not as separate independently functioning organizational entities. A closer look at these four functions is

necessary to see how the systems management approach alters these four functions in the management process.

Johnson, Kast, and Rosenzweig identify the planning function as occurring at three different levels in the systems management approach:

1. Top level planning for the establishment of goals, objectives, and broad policies.
2. Project and facilitating level for resource allocation.
3. Operations planning level for optimum allocation of resources (Ref 77:377).

The systems concept in planning should begin with management's acceptance of the need to think on these levels and how to integrate these levels into a hierarchy. Managerial planning, under the systems approach, gives recognition to the integration of information at all three levels and recognizes the interactions among them.

The systems management approach to the function of organizing de-emphasizes the reliance on the traditional functional approach and the vertical hierarchy. The systems approach focuses on the organization as a system of mutually dependent parts and variables, not as isolated parts but as subsystems.

The systems management approach stresses the control function by the identification of decision-making centers and the provision of adequate information to these centers. Within the systems approach, the control function must compensate for environmental changes while maintaining

the system in operation regardless of the variations (Ref 76:86).

Directing is concerned with stimulating the organization to undertake action along the lines of a plan of action (Ref 44:6). Direction in both the functional and systems approach deals with the dissemination of orders and the acceptance and execution of those orders. From the systems point of view its direction must operate effectively and adapt to a changing organizational structure. Directing is therefore fundamental to the systems approach to management in the activating of the organization through motivation and stimulation under directive leadership.

The review of literature regarding the systems approach to management, the systems management concept, and the functions of management as they relate to systems management, lead logically to analysis of the application of the systems management concept, which follows in the next chapter.

A discussion of the past, present, and future applications of the systems management concept, however, brings with it a semantics problem worthy of a systems analysis in itself. The problem exists of how to differentiate among the terms systems management, project management, program management, and weapon systems management that are frequently found in the literature and used almost synonymously. Therefore, before looking at the applications of the systems management concept, an examination of the use of these terms is presented as a prelude to the discussion of applications that follows in Chapter V.

IV. Systems Management - Terminology

Much confusion has arisen both in literature and in management practice as to the terminology of the systems management concept. The current vogue in both business and Government is to apply the systems approach to management problems, but under what label does this pertain?

From the previous chapter it was found that the systems approach to management was the result of the growing complexity and wide diversity of operations in today's advanced technology. Systems management was treated as a concept of applying the systems approach to management. Why then does confusion arise when one reads about systems management?

The problem reduces to a problem in management semantics. As long as systems management is treated as a concept, little confusion arises. Confucius long ago recognized the emphasis that semantics plays by offering:

If names be not used correctly, then speech gets tied up in knots; and if speech be so, then business comes to a standstill (Ref 46:73).

Likewise it is when the systems management concept is applied that the proliferation of the labels and names arise to describe it.

Program and Project Management

The problem arises because the systems management concept has been variously and loosely labeled, "systems management", "program management", "project management", and in the military services, "Weapon System Management". All of these

terms are applications of the systems management concept. Just what then are the semantic differences among these terms so commonly found in the literature on the systems management concept? Indeed a concentrated effort is needed to clarify and reduce the wide range of systems management descriptions.

The task of differentiating between program management and project management proved to be quite difficult, in fact nearly impossible. George A. Steiner and William G. Ryan attempted to show the difference by stating the following:

A program is an undertaking of a Government agency which integrates one project with many others into a larger system to achieve agency goals. A project is concerned with the article below the interface between a Government agency and the organization; it encompasses the production of an identifiable nonrepetitive item, large or small in scope, under conditions of technical uncertainty, and to be completed at a specific time (Ref 135:7).

This differentiation, however, was made only to arrive at a workable solution to their subject and cannot be considered as being truly representative of the literature. A few of the definitions found concerning programs and projects were:

1. A project is an organization unit dedicated to the attainment of a goal - the successful completion of a developmental product on time, within budget, in conformance with predetermined performance specifications (Ref 66:766).

2. A project is a formal approach to an objective to be achieved (Ref 10:16).
3. A project is a unique, well-defined effort to produce certain specific results at a particular point in time (Ref 39:30).
4. A project is part of a general program (Ref 59:16).
5. A program is a complex set of plans for a major undertaking within the over-all enterprise goal (Ref 59:16).

Most of the literature, however, made little distinction between a program and a project. This fact was also apparent from the lack of differentiation between the two terms on the part of various industries and the government. The writer offers that a case can be made that projects are contained in programs and are of shorter duration. This distinction, however, does not appear to be generally accepted in the literature.

Concerning program management and project management definitions, the following selected definitions appeared in the literature:

1. Program management is a dynamic philosophy geared to changing managerial requirements in the research, development, procurement, and utilization of large-scale military and civilian systems (Ref 79:194).
2. Project management is recognized as a specialized branch of management which has evolved in order to coordinate and control some of the complex activities of modern industry (Ref 92:1).

3. Program management is essentially a managerial approach for adapting to the systems concept (Ref 80:46).
4. Program management is an organizational device, found mostly in the defense industry by having advantages that make it useful in many other areas where the same fundamental problems exist (Ref 91:151).

These four definitions were selected to emphasize the wide variance of labels that are attached to essentially the same concept. In these four definitions program or project management variously appears to be either a dynamic philosophy; a specialized branch of management; a managerial approach; and an organizational device in order to change managerial requirements; coordinate and control complex activities; adapt the systems concept; and solve fundamental problems. It is readily apparent that little attempt has been made in the literature to differentiate program management and project management. Keith Davis accepts this fact as he relates program and project management in his statement:

Program management, also called project management, is an outgrowth of government necessity to develop complex military projects and make them operational in the shortest possible time (Ref 30:173).

Numerous well-known large companies, General Electric, North American, General Dynamics, Avco Corporation, North American Aviation, Hughes, Lockheed, Radio Corporation of America, and Sperry-Rand use either the terminology program management or project management (Ref 83:59). Westinghouse, however, uses the term systems management.

John A. Gilmore contributes to the semantic problem by equating systems management and program management when he states:

Systems management (or program management) is the continuing control and coordination of the system development and engineering processes (Ref 55:11).

Harry A. Jacobs offers that:

Systems management is applied to selected programs, particularly those relating to new weapons (Ref 74:36).

Gilbert Kelton adds that:

The philosophy of management has turned toward the systems concept, principally manifested through the program or project management structure (Ref 83:59).

Vernon L. Grose speaks of applying systems management to civilian problems synonymously with the phrases "systems approach" and "systems methodology" (Ref 57:3).

The above discussion was presented as a typical cross section of how the terminology of the systems management concept has been abused in the literature. This abuse has continued in the terminology used in documents issued by the United States Air Force.

Air Force System/Program Management

The United States Air Force has added to the semantic problems by using the term "Systems/Program Management" in the 375 Air Force Systems Command Manual (AFSCM) series and

the term systems management throughout various Air Force Regulations. In AFSCM 375-4 the concept is stated as:

The function of systems management is to control identification, design, production, test, deployment, and operation of a system (Ref 33:45).

The Air Force further adds that under the 375 Air Force Regulations, system management organizes and employs Air Force functional agencies to accomplish approved program objectives (Ref 143:17). Here again the confusion of terminology is revealed by relating systems management and programs.

Kast and Rosenzweig further complicate the problem of semantics by introducing the term weapon system management as though it were distinct, different, and new terminology in the field of management:

The weapon system management concept implies the coordination and integration into a unified system of all the functions necessary for mission accomplishment - from perception of need, through design, production, delivery, to final system utilization (Ref 78:37).

Kast and Rosenzweig point out, however, that systems management, program management, weapon system management, and project management have all been used to designate the integration of the management functions (Ref 79:195). These authors continue by stating that the thread of commonality is that each is the integrated management of a specific program on a systems basis (Ref 79:195). This is neither new

nor of distinctly different meaning in management parlance and literature.

While Kast and Rosenzweig have attempted to establish some order from a terminology chaos, the literature has and continues to add confusion and contradictions concerning the terminology of the systems management concept.

For the purpose of this report, only the systems management concept is deemed important. Its application through whatever name that might be applied - systems management, program management, project management, or weapon system management - is merely a choice of a managerial semantic label. Time and the demand for clarity will require a more certain delineation.

The next chapter traces the evolution of the systems management concept. The evolution of the systems management concept will not solve the semantic problem of its application, but will aid in understanding why this semantic problem exists.

V. Systems Management - Evolution

The systems management concept fosters a way of thinking which helps to clarify some of the complexity of the process of management. This has been basically true in the past, the present, and in all probability, will continue to be true in the future. In order to appreciate the systems management concept it is necessary to trace its evolution and project what implications are available to predict its future. Also it is significant to examine its current status in the literature as one compares it to a school of management thought.

Past

The year 500 B.C. was given in the introduction for the statements by Mencius concerning the systems concept. Many ancient wonders such as the Great Wall of China (300 B.C.) were in all probability constructed under the systems management concept. Even earlier than these events, however, was the building of the Egyptian pyramids (2680 B.C.) (Ref 69:211). Clearly the systems management concept was and continues to be connected with man's perception of his environment. Man has attempted to create order out of chaos and herein lie the roots of systems management.

The concept of systems, or the germ of the idea, appeared as early as 1912 in the formal management literature when Henry P. Kendall wrote on scientific management (Ref 26:3). One major impetus for attention to the systems management concept in more recent history has been in the area of

weapons development. The trend in increased complexity and risks and scale of operations, caused both industry and Government to place greater emphasis on the systems management approach. As Dr. Elli A. Johnson, Operations Research Officer, John Hopkins University states (Ref 138:30):

Up until about 1000 A.D. weapons had a lifetime of about 400 years; from about 1500 A.D. until the beginning of the twentieth century, a lifetime of about 50 years. But today weapons systems have a lifetime of about five years, and tend to be obsolescent by the time the first units come off the production line.

The major emphasis in the growth of the systems management concept has been due partially to this obsolescence factor. The obsolescence factor is the result of the pressures of accelerating technology and short lead times in the development of major weapon systems. In addition to the obsolescence factor, cost over-runs in major weapon systems have required greater coordination of information and management control.

The systems management approach appeared to blossom after World War II under the many names previously mentioned in the last chapter. Project management or program management were found to be valid applications of the systems management concept, particularly in the aerospace industry. Again it is emphasized that project management is an application of the systems management concept and is presented here because of its major contribution in the application of the systems management concept.

Project management has been one of the major applications of the systems management concept during the past two decades. The complexity of modern technology required the integration of activities of persons often physically separated of very diverse, highly specialized competences. The project organization brought these talents together in a composite unit dedicated to a particular task using essentially a systems approach.

In the Department of Defense, project management can be traced from the development of the atomic bomb under the code name "Project Manhattan," through the Polaris submarine, and several of the ballistic missile programs (Ref 20:201). Since the early 1950's the technological explosion in military weapons systems concepts spawned the need for new management techniques. The first major breakthrough in the development of a fresh management approach to the management of complex programs was conceived by the U.S. Air Force and titled the systems management concept (Ref 53:13).

Within the organization of project management two complementary management organizations generally exist; the vertical traditional organization and the horizontal project organization.

Systems management procedures were established which cut across the traditional functional lines of the organization to ensure that all weapon systems development and operational goals were realized. Since 1950, all of the military departments have made some use of the project management concept (Ref 20:201).

A major impetus to the implementation of the systems management concept and its application in the form of project management was given in 1959 when Secretary of Defense Robert S. MacNamara vigorously directed the application of the systems management concept in the armed services.

Prior to the application of the systems management concept to weapon development, the construction industry was using a basic form of project organization. It was in this area that the need existed to approach the building of single, costly projects such as dams, turnpikes, and large buildings using the systems management approach (Ref 21:16).

In both the development of weapons and in the construction industry, project management produced many valuable tools for managers in the form of the Program Evaluation and Review Technique (PERT), Critical Path Method (CPM) and linear programming as well as the further sophistication techniques now used in operations analysis, operations research, and simulations. Simulations have tended to link mathematical models with computer programs (Ref 96:64).

Project management moves even closer to synonymy with the systems management concept when entire projects are brought together to produce a super-project. This is a truly most auspicious use of project management techniques (Ref 43:35).

Dr. Robert L. Roderich applied the systems management concept in his role as program manager in the building of the unmanned lunar spacecrafts in the Surveyor Project. He cited the following approach which he called rules for good management:

1. Make sure that all portions of the system will work together to form a compatible whole. Expect the unexpected in engineering problems as the program progresses, and be prepared to make technical compromises to solve them, even to using occasional unorthodox practices.
2. Create a climate for work in which the employees tell their superiors what the problems are instead of trying to hide them.
3. Organize and integrate work schedule, with the help of PERT or some other system, and reorganize it as the program progresses.
4. Make allowances for human frailty. A flexible work schedule recognizes that not everyone will do his job well in the shortest time.
5. Set up efficient communications. Keep all employees on the program, including all subcontractors, informed of the value of their contributions to the full program.
6. Be prepared to work round-the-clock to overcome design problems and keep your schedule.
7. Ensure that the good men stick with the program until it is finished (Ref 49:44-45).

Not only are these rules for good management applicable to the Surveyor project, which turned out to be very successful, but are equally applicable to past and present day project management.

Present

As in the past where project management was applied to large-scale complex projects, the present state of systems management is deeply involved in the development of weapons.

The systems management concept is applied presently in the form of project management in order for projects to have a better chance for success in the dynamic, scientific, technological, and competitive environment of the modern world. The systems management concept, however, is not restricted to the development of weapons, but its accelerated growth and new attention are deeply rooted in this area. The systems management concept is, however, referred to less frequently in the literature outside the weapons development area.

Project management has and continues to be the predominant operational technique in the aerospace industry and has recently made inroads into strictly commercial companies (Ref 7:77). Allan Harvey, President of the Dasol Corporation, Management Consultants in Physical Distribution expresses his concern about how little impact the systems management concept has had on the way most management have gone about running their businesses:

We know much more today about systems involving rapid change, high degrees of uncertainty, and complex interrelationships than we did five years ago - much more than we are using in our business. Only a handful of companies have put the systems approach to work: their problems range from production of ladies' blouses to servicing of farm equipment, and from the distribution of beer to the filling of subscriptions to a magazine and a record club (Ref 64:60).

While Mr. Harvey has not included all of the areas where the systems management concept is presently applied, he does point out the fact that the concept is certainly

only applied in limited areas. The systems management concept is currently being applied in such areas as oceanics, education, and water management (Ref 144:20).

Numerous studies and programs in the research area also use the systems management approach. Dr. Isidor Chein of New York University used the systems management concept to develop a model to estimate the effects of housing projects and social welfare programs on juvenile delinquency (Ref 93:65). The systems management concept has also been applied to the Syracuse Police Department in an attempt to achieve the control of urban crime (Ref 38:59). This approach proved to be very successful and should have some major implications for municipal police organizations elsewhere.

The systems management concept has also been successfully used in the coordination and control of home building programs (Ref 53:16). The relative fewness or general lack of applications of the systems management concept outside the weapons development area points out the failure of this concept in receiving wide acceptance in the business community.

Part of the lack of organizational acceptance of the systems management concept rests in the failure on the part of companies to accept the human requirements of operating in an integrated system. While the systems management concept is a combination of functional structure of the classic human-hierarchical form and the general systems

structure, present day management appears to fear the breakdown of the traditional functional specialization. This apparent fear, however, is in all probability not justified. This apparent fear rests on the basic need of man for security and the doubts created whenever change is considered.

The present day systems management concept is not in conflict with the traditional primary functions of planning, organizing, directing, and controlling - in fact it provides a model for their development and implementation. Herbert A. Simon brings out this point when he states:

The term "systems" therefore, does not denote an approach to management theory that is anti-theoretical to, or even distinct from, empirical observation, development of behavioral theories, use of a decision-making frame of analysis, or application of mathematical techniques. It denotes a concern, in the conduct of all these activities, with complexity and with the necessity for developing tools that are especially adapted to handling complexity (Ref 76:427).

The present day systems management approach is thus believed to result in a more adequate model in modern organizations and of the types of human relationships necessary to enable them to function. The systems management concept provides a framework for carrying out the functions and new techniques of management for integrating these functions.

Traditional bureaucratic models of organizations and individuals, adequately described much of the early twentieth century organizational life. Today, however, management is assisted by the use of computers in which masses of data can be processed to help determine the relationships among various

parts, and the change brought about in one part due to a change in another. Even automation itself is sometimes viewed as the implementation of the systems concept (Ref 77:381).

The present day organization is viewed as a subsystem of a large environmental system, but only occasionally organized along this concept. If any one word best describes the importance of the systems management concept it would have to be the word future. For it is the future that will test and provide the thrust for implementing the systems management concept.

Future

It is not unreasonable to predict that the systems management concept will be applied to the decision-making process relating public programs and the management of resources on a national or international order of magnitude. The systems management concept will find increasing applications in the non-commercial sectors for dealing with problems such as transportation, urban renewal, and pollution control (Ref 79:198). It will also find extended applications in the social-economic problem areas.

Traditionally, we have examined community and other social problems one at a time. There were traffic problems, garbage problems, pollution problems, political problems, economic problems, social problems, educational problems, juvenile delinquency problems, housing problems, and others. The usual approach in these problems was to treat each problem separately. This approach seemed to work as long

as community life was simple. But economic growth, increased population, congestion, and an increasing mutual interdependency of the citizenry revealed flaws in this simple, direct approach (Ref 93:65). As problems became complex certain interrelationships became apparent and viable solutions usually recognized the many interrelationships. It is in this area of civil problems where the application of systems management concept seems to offer much promise in the search for solutions.

A few of the areas to be considered and the problems involved in these areas are:

1. Social - overpopulation, racial prejudice, rampant crime
2. Economic - poverty amidst plenty, inflation/deflation modulation, mass transit
3. Ecological - air/soil/water pollution, loss of natural resources, thermal pollution
4. Political - urban blight, international power flux, anarchy/violence (Ref 57:6).

This fearful list of socio-economic problems facing mankind brings to mind the Four Horsemen of the Apocalypse (widespread armed subjugation, world wide war, universal famine, and death of man) as a specter of impending doom (Ref 57:6). The systems management concept may offer a sound approach to the recognition and resolution of these very complex and involved problems.

If indeed the systems management concept can be applied to these future problems, and can be traced back to the Egyptian pyramids, what then is the current status of systems management as a school of thought in management?

A "New" Approach?

Having traced the systems management concept from the Egyptian pyramids, through its use in the development and acquisition of complex weapons of the 1970's, and predicting its future as a solution to present and future social-economic problems, the discussion leads to a review of the position systems management occupies in literature as a school of management thought.

Semantics seems to be the key in differentiating between the "old" and "new" systems management concept. Traditional managers still use the terminology of planning, and controlling while the "modern" manager speaks in terms of inputs, feedback, and suboptimization. Managers have long dealt with the problems of interrelationships of parts even though they lacked a systems terminology. Systems management concepts have, however, evolved to provide valuable concepts and emphasis for current management thought and practice with the following contributions as presented clearly by Justin G. Longenecker:

1. A strong emphasis upon significant interrelationships within a business firm, counteracting tendencies toward a provincial concern with ones' own department or segment of the total business.

2. An extension of this emphasis upon interrelationships into a macro setting, permitting a more realistic evaluation of complex social problems.
3. A stress upon the open nature of business systems, thus focusing attention upon the firms' relationships with its environment.
4. A basic rationale for the management scientist as he applies the tools of operations research to the solution of business problems (Ref 93:66).

Advocates of the systems management concept exaggerate its newness. The principles on which the concept is based are actually time honored. They are in fact the principles on which many of our great businesses have been built. The giant corporations of AT&T and General Motors both prospered because each viewed its organization as an integrated whole (Ref 64:63). The systems management concept, therefore, offers a blend of something old and something new. It is in this that the valuable and distinctive contributions of systems management may be used more effectively and understandingly by one who has an appreciation of its ancestry.

A panel of the Federal Management Improvement Conference held in Washington, D.C. in 1970 concluded that "the systems approach is a logical step in the development of management theory" (Ref 37:26). While it may be a logical step, only two sources of the over 200 management sources reviewed in the research effort recognized a systems school of management.

George R. Terry lists the systems management school as one of eight schools of management thought (Ref 140:93).

He explains that the concern of the systems management school is to develop a systematic framework for describing relationships of the empirical world dealing with management.

David I. Cleland and David C. Dellinger point out the newness of systems management as a school of management by acknowledging full "responsibility" in including it as a school of management thought:

This most recent school opines that traditional management philosophy is pervaded with vertical flow of authority and responsibility relationships and emphasizes parts and segments of the organization. According to the systems school, the traditional approach does not place sufficient impact on the inter-relationships and integration of activities involved in the total management system. The systems concept provides a way of thinking about the management process. It presents a theoretical framework for viewing the internal and external environmental factors as integrated into the whole (Ref 25:2).

Because only these two sources listed a systems management school as a separate school in management thought, it is questionable as to whether it really should be held in such high regard, or viewed as a totally new conception.

Probably the answer will lie in just how systems management is applied in the future, particularly in the social-economic areas. It is of interest to note that Terry did not include a systems school in his fourth edition in 1964, but introduced it in his fifth edition in 1968.

VI. Summary and Conclusions

Summary

The purpose of this study was to identify and differentiate the terms, definitions, and concepts as they appear in the literature associated with systems management, establish whether systems management is really a new approach in the management field, and present a current assessment of the past, present, and future of the systems management concept. In an attempt to achieve these objectives, a logical sequence of steps were presented. Before attempting to describe the systems management concept, a foundation was established concerning what a system is and what the systems approach encompasses. This foundation was established without any reference to management.

The definition of a system as found in the literature usually involved the concepts of integration of procedures, and interacting of components, to achieve an objective. The idea of order, plan, and meaningful arrangement proved to be most significant in the views and expressions of writers of various definitions found in the literature. The systems approach is based on a belief in order and has only recently received impetus as the product of twentieth-century trends in technology. These trends have centered on the linking of technology and science, and the development of the systems concept in response to this linkage. The systems concept is used so frequently and yet so vaguely that it sometimes appears to be only a fashionable catch-phase, a new label on

an old package. More and more managers are, however, discovering through personal experience that it is a meaningful and feasible concept.

After establishing a foundation for discussion of systems and the systems approach, the subject of management was introduced and related into the concept of a system. No generally accepted definition of the systems approach to management was found in the literature. The systems concept and management are linked in that the role of management can be viewed as the management of interrelationships. The systems management concept was seen to provide a model for better understanding relationships and interdependencies among the functions of management in a changing organization responding to a dynamic environment.

An enterprise was perceived as a man-made system, the internal parts of which work together to achieve established goals, the external parts to achieve interplay with its environment. The systems management concept integrates the available facilities and relates needed activities toward goal achievement by means of systems for achieving the desired result. The systems serve as the means through which the manager performs the functions of management and implements the factors of production. The systems approach to management emphasizes the interdependence of elements so that the manager is continually forced to view the organization as a component of the overall operating economy. The importance of establishing the goals of the enterprise in unequivocal

factor appears as a paramount prerequisite throughout the literature of systems management.

Project management, often used synonymously with the term program management, is one direct application of systems management. This application of the systems management concept evolved as the fruit of necessity, an answer to a need that developed within the recent years of rapid technological and giant cooperative undertakings by both industry and government. Obsolescence, short lead times, and cost over-runs are a few of the factors that have caused the need for greater coordination of information and management control in major weapon systems development.

Just as the semantics problem plagues management in general, there exist a semantics problem in the systems management field. No clear cut definitions exist to differentiate the terms systems management, program management, project management, and weapon system management as they relate to the systems management concept. It is the view of the writer, however, that each of these terms appears in the literature in direct connection with the application of the systems management concept.

The systems management concept can be traced to the Egyptian pyramids and to the building of the Great Wall of China. While just recently in the last two decades has the concept been broadly applied, the real value of the concept appears to lie in the future. Just as its value lies in the future, its future acceptance as a school of thought in management likewise must wait for the test and

passage of time. In fact our society has just begun to perceive the dynamics of the application of the systems management concept to social-economic problems as well as the more visible uses in operations of industrial and governmental missions.

Conclusions

The systems management concept is not a promising panacea for almost every problem facing mankind. The growing acceptance of the systems management concept has led to apprehension and some misapplications, partially because of the lack of understanding of its principles. Some measure of success has been achieved, however, in the development of complex weapon and space systems where it has had its greatest impact. In order to prevent possible failure of the concept, constant questioning and reassessment is needed when an organization applies the systems management approach.

Ultimately, the systems management concept draws its strength from sound management principles and provides a framework for integrated decision-making. Each organization must be designed as a unique system or subsystem performing the functions of management in conjunction with operation of the total organization and not as separate independent entities. Certainly finance and production, research and development, and marketing are all interrelated. Management has separated this interrelationship and divided it into functions with rather firm and inviolate boundaries of authorities, and responsibilities. Systems management

attempts to put it all together again, restoring the organization to more real and inherent unity.

The systems management concept attempts to seek the advantages of both the vertical structure of the organization in which the control and performance associated with autonomous management are maintained and the horizontal structure in which better continuity, flexibility, and expanded use of scarce talents may be achieved. The systems management concept has and continues to be of great value in the structure of organizations. The future of the free enterprise system with institutions of ever increasing size and complexity may well be decided upon by the role the systems management concept plays in the future. In fact the role that the systems management concept plays in developing and applying the American technological advancements during the next few years, may shape our future and determine our survival or extinction.

It is false to assume that the keys to systems management are computer technology and mathematical models. The paraphernalia of quantitative measurements and information can only offer limited assistance. Much of the relevant decision data and judgments will continue to come from emotion, mood, morality, and intuition. Systems management stresses human adaptability, and in the final analysis people are still the most important ingredient in the systems management concept.

Recommendations

Based on the research conducted in the preparation of this paper, a number of recommendations are offered by the writer as future areas of study within the scope of the systems management concept. A study should be accomplished that more clearly relates the functions of management to the systems concept. This study should emphasize just how these functions are changed under the systems concept. A study of how the matrix type of management concept currently appearing in the literature relates to the systems concept should prove interesting and provide insight to its future application or limitations. A study of the various conceptual models used to explain the systems management concept, and particularly project management, should be compiled and contrasted as to the similarities and differences. This would possibly result in the creation of a large, general conceptual model of the systems management concept. Probably the most interesting and challenging study for future research would be an investigation of how the systems management concept is being or can be applied in the social-economic areas. In all probability, the solutions to the many ecological problems facing the world today will have to be solved using the systems approach and this should soon be reflected in the literature.

This concludes the body of the research report. It has proven to be an enlightening and challenging experience in addition to a concrete learning endeavor.

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GSM/SM/71-14

APPENDIX A

Letter to Management Journals

Gentlemen:

I am an Air Force officer currently enrolled in the Systems Management Masters' Degree Program, Air Force Institute of Technology, Wright-Patterson AFB, Ohio. As a graduate student of management, I have become keenly aware of semantic problem areas existing within the management profession. Several courses have emphasized the importance of definitions and terminology and the confusion that now exists.

In order to study one of these problems, I have chosen as a thesis topic the study and analysis of the field of Systems Management. The approach will be one of reviewing terminology, literary status, applications, and philosophy within the scope of the Systems Management subject area. It is my objective to identify, define, and differentiate working terms and concepts associated with, and peculiar to, Systems Management and Project Management and to trace the development or evolution as a school of thought in the management field.

The study will include a comprehensive review of secondary source material from libraries and other literary sources. I feel that my efforts will be more complete and contributive with the inclusion of articles, documents, pamphlets, etc. that have been written, reviewed, or edited by your publication. I will much appreciate and properly acknowledge any material that you can provide to assist me in my study. I will be grateful if you can please advise me of any other material or other sources that could be of assistance in this research.

Thank you very much for any service you can provide to me. Please forward any material to:

Captain Roger L. Williams
420 N. Cherrywood Avenue
Apt. #4
Dayton, OH 45403

Sincerely,

Roger L. Williams
Capt. USAF

GSM/SM/71-14

APPENDIX B

Letter to Management Associations

Gentlemen:

It is with sincere appreciation that I take this opportunity to thank you for your personal interest and cooperation upon my recent visit to your association. The professional insight that I gained from the discussions on Systems Management and Project Management have been very helpful in my thesis research project. The use of your library and literary sources have also proven to be of great assistance.

I am sure that you and your organization have made my research efforts more complete and comprehensive. In my completed research paper I will properly acknowledge the assistance that you have provided me.

Let me also take this opportunity to express a cordial thanks on behalf of my thesis advisor Professor Raymond H. Klug, Professor of Management, Air Force Institute of Technology. The sincere interest and cooperation your organization exhibits to his students is indeed appreciated. Again thank you very much.

Sincerely,

Roger L. Williams
Capt. USAF

